An Introduction to Smartcool

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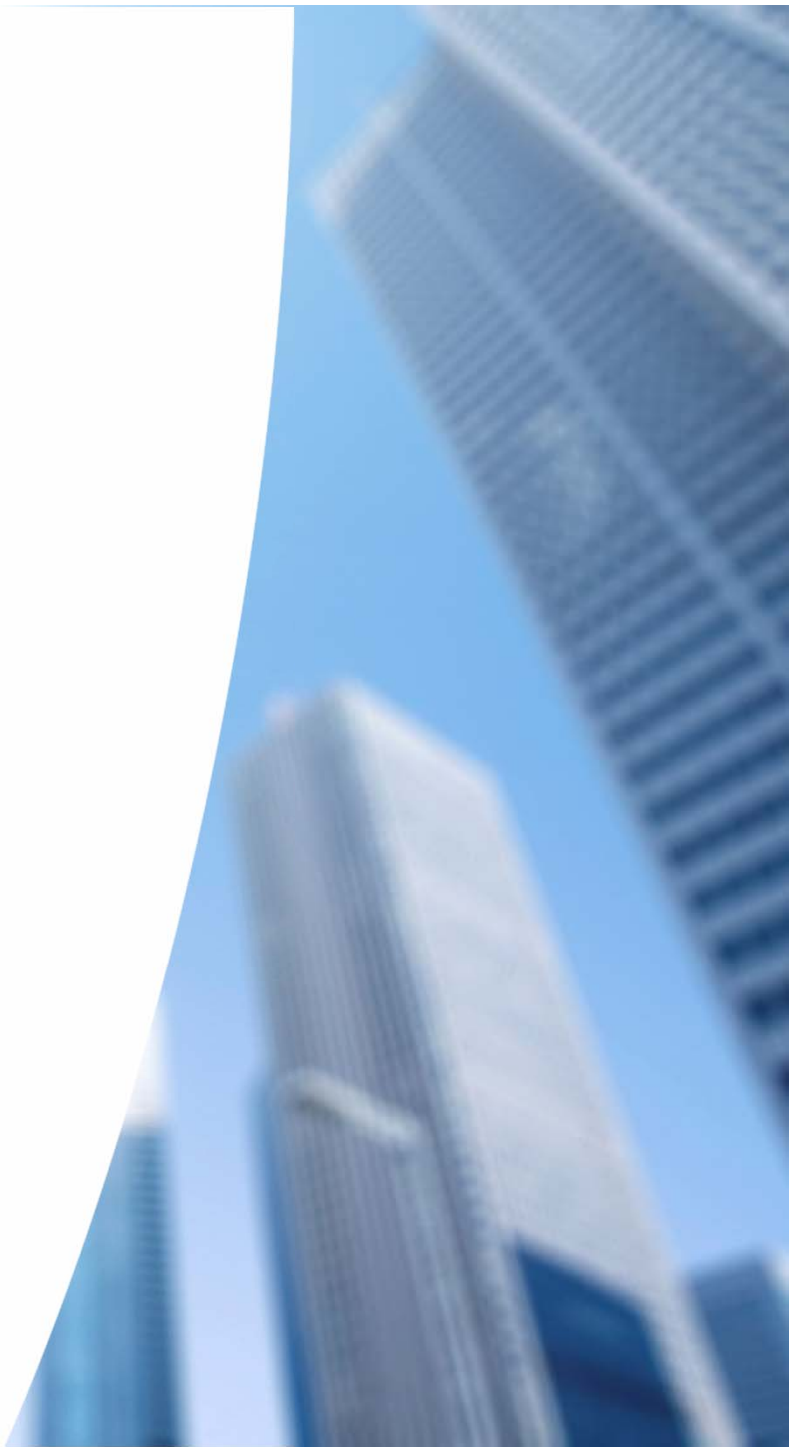
Todays Agenda

- Overview about Smartcool
- How our products work
- Installation of an ECO3
- Post installation validation
- View the actual installation
- Lunch
- Hands on ECO3 demo unit
- Q&A



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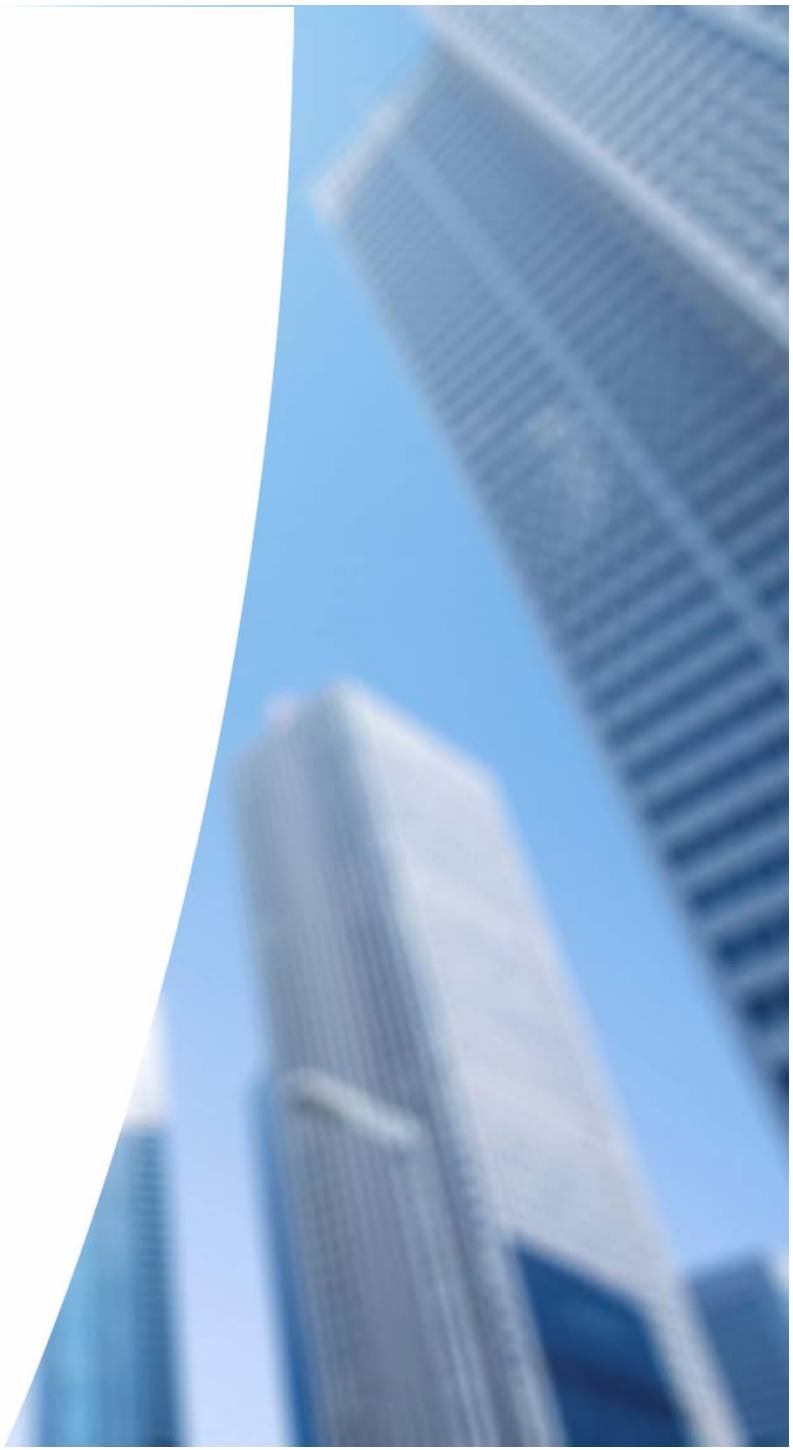
About Smartcool



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Smartcool Systems Inc

- Founded over 20 years ago by an Australian refrigeration engineer
- Purchased by a team of Canadian investors in 2006
- Developed as a an energy efficiency solution for commercial and industrial HVAC-R systems
- Smartcool's energy efficiency solutions have been adopted by some of the world's most prominent companies across a range of industries
- Over 30,000 installations worldwide

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What Is Smartcool

- Smartcool is the developer / manufacturer / distributor of a unique hardware / software control solution
- Reduces the electricity usage (kWh) of air conditioning, refrigeration and heat pump compressors by improving the performance of the compressors while maintaining temperature and humidity control
- Smartcool is a modular retrofit technology, can be applied in air conditioning, refrigeration and heat pumps systems
- Risk free solutions compatible with all existing equipment and controls
- Average payback period for customers is 18 to 36 months.

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Our Products

ECO3™

ESM™

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The ECO3™

- Suitable for single and twin compressor systems
- Refrigeration, Air Conditioning or Heat Pumps
- IP64 Rated for outdoor installation
- Minimal technical knowledge needed for installation

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The ESM™

- Modular systems provides total flexibility
- Refrigeration, Air Conditioning
- Single stage of multi stage compressors
- Turbo core, Centrifugal, Screw, Reciprocating, Scroll
- Remote Coms package available
- Dynamic demand response available

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Key Features

- Reduces compressor run times through more efficient control
- Average kWh savings

  ECO3™ 15% to 25%
  ESM™ 10% to 20%
- Interfaces with existing controls (does not replace them)
- Provable savings
- Zero risk to current equipment or effect on manufacturer warranty
- Maintains temperature performance

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Target Markets

- Food Retail
- Fast Food Outlets
- Coffee Shops
- Banks
- High Street Non Food Retail
- Data Centres
- Food Manufacturing
- Manufacturing Process Cooling
- Cold / Chilled Storage
- Hotels
- Hospitals
- Large Office Buildings
- Gyms

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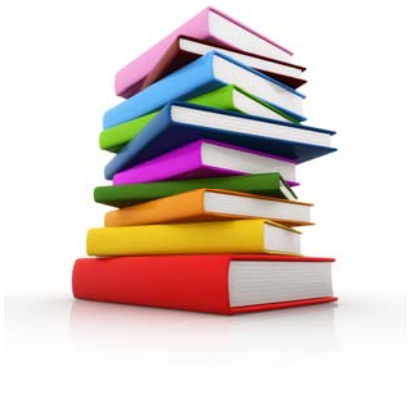
PDF Handouts



- Smartcool Corporate Brochure
- Product Brochure for ECO3™ and ESM™
- Some case studies

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So How Does It Work?

Non Technical Explanation

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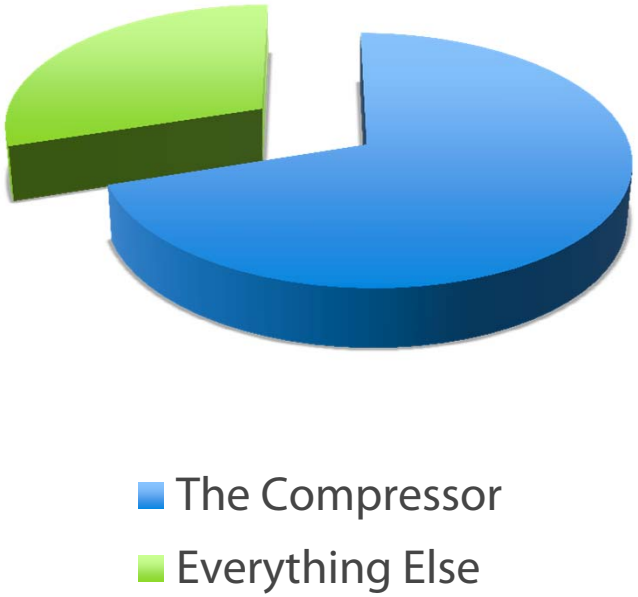
The Compressor

- In any refrigeration system, the piece of equipment that uses by far the most amount of energy is the electric motor of the compressor.
- Often this one element can consume up to 70% of the total energy used by the refrigeration plant.
- Smartcool's energy saving controls focuses on this one item

Electrical Load



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Run Time

- As a control solution, the aim of Smartcool is to reduce the amount of time the compressor needs to run for, over and above that of the existing control strategy.
- When a compressor is not running it doesn't use any energy.
- You could just switch the compressor off and save energy, but the downside would be an impact on the end temperatures required.
- Smartcool has a method of reducing the run time of a compressor AND still maintain the required temperatures
- We don't use 'magic' but rely on science and the physical characteristics of refrigerant. These principals are known by every cooling engineer.

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The Science

- In simple terms, the compressor is just a pump, pumping an amount of refrigerant gas around the cooling system.
- Like a car engine the compressor has a fixed volumetric compression chamber*[1].
- However, at different refrigerant temperatures (and pressures) the capacity of the compressor changes.

Temperature & Pressure v Capacity

- At higher refrigerant temperatures (and pressures), when the gas is more dense (the refrigerant molecules are all more closely packed), the compressor is able to 'pump' more refrigerant – we say it has a greater 'mass flow' rate.
- At lower refrigerant temperatures, when the gas is less dense, the compressor is able to 'pump' less refrigerant – we say it has a lower 'mass flow' rate.

What Smartcool Does

- The Smartcool control solution aims to dynamically adjust the ‘cut in’ and ‘cut out’ point of the compressor. By doing this it can effect the suction pressure that the compressor is working at, increasing its COP*2.
- If we can increase the amount of cooling being provided when the compressor runs, to achieve the same amount of cooling as the existing control we can run the compressor for less time and therefore save energy

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Installation

- The Smartcool is installed in series with the existing control solution
- It monitors the load of the plant and when the existing control is demanding for cooling it can allow the compressor to run of it can turn it off.
- Typical run time savings are between 15% and 25% equating to a reduction in kWh consumption of similar levels
- There will be no negative impact on the ‘end temperatures’

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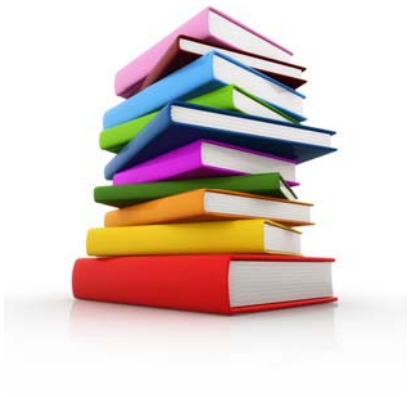
PDF Handouts



- Elevator Pitch Presentation
- ECO3™ FAQ

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Installation

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Installation – Quick Start

ECO3
Quick Installation Guide

Version 23

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Recommended Pre-Installation Steps

Before setting out to complete any ECO3 installation, you should be familiar with the detailed content of the *ECO3 Installation Manual*. In addition, Smartcool recommends you take the following steps prior to installation:

1. Know what power supply is available at the installation site, understand the control circuit of the system and determine where you will be mounting the ECO3.
2. Collect the necessary peripheral items.
3. Remove the wiring cover on the ECO3.
4. Connect the wiring to the channel(s) inputs and to the 24 VAC input.
5. Close the wiring cover and fasten with the supplied screws.

Pre-wiring the ECO3 will make the installation itself much easier. Alternatively you can do this on site by following the steps in this guide.

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Installation – Quick Start

Step 1

Decide where you will mount the ECO3 and how much wire is needed to reach from the ECO3 to where you will wire into the control circuit.

The ECO3 needs to be mounted on a flat surface. If installed outdoors, it needs additional protection correctly rated to the environment.

Step 2

Mount the ECO3 backplate. If you need a transformer for the power supply, mount this as well.

Make sure that you are mounting the backplate straight, and using the appropriate fixtures for the surface.

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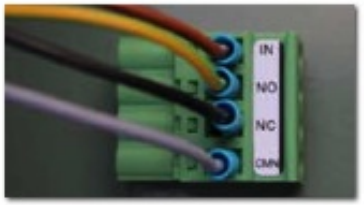
Installation – Quick Start

Step 3

If you have not done so already, wire into the ECO3 channel terminal connector. An ECO3 Dual will have two channels to wire in.

Remove the wire casing to access the connector blocks.

Remove the green terminal connector from the base of the ECO3 and wire into the IN, NO, NC and CMN points. Make a note of which coloured wire connects to each point.



Step 4

Remove the small green terminal connector marked 24 VAC and wire in the power supply inputs.

Check that all the wiring connections are secure.

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Installation – Quick Start

Step 5

Confirm that the wiring is running smoothly out of the wiring casing.

Close the base of the ECO3.

Screw the wiring casing base into the main body of the ECO3.

Step 6

Mount the ECO3 on the backplate by sliding it up until it clicks onto the metal bracket.

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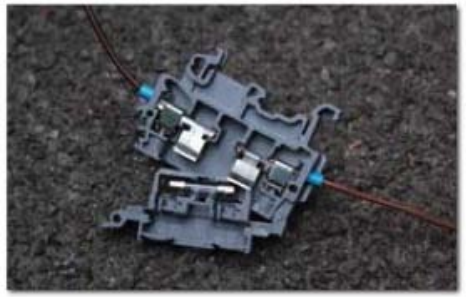
Installation – Quick Start

Step 7
Run the wiring from the ECO3 to where you will wire into the control circuit.

Use zap straps (cable ties) or other suitable means, like in the image below on the left, to make sure the wiring is neat and tidy.

As in the example in the lower right image, you may need to drill into a control panel, using the appropriate rubber seals to maintain the integrity of the panel and to protect the cabling.

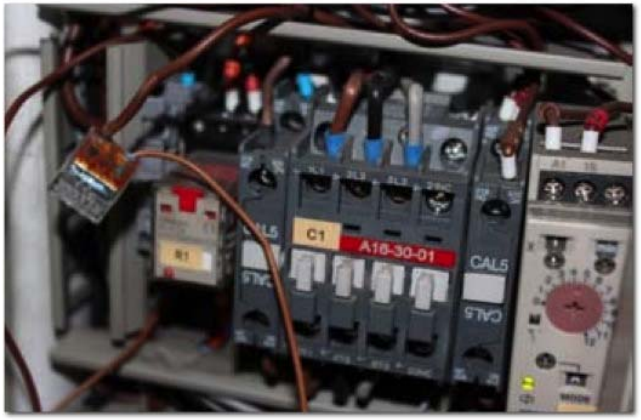
Step 8
Install the correctly rated fuse and associated fuse carrier for circuit protection.



Installation – Quick Start

Step 9

Fit the appropriate terminals onto the wiring from the ECO3, ensuring that you are referencing the correct wires.



Refer to the *ECO3 Installation Manual* for further detail, wiring diagrams and any aditional wiring that may be necessary for your specific installation.

Step 10

You are now ready to connect the power supply to the ECO3.

Ensure that the system is free from voltage before you wire in.

Ideally, you will wait until the compressor cycles off, then turn off the master power supply rather than cutting the compressor off mid-cycle.

On the power supply input to the ECO3, wire in a circuit breaker or appropriate fuse.

Installation – Quick Start

Step 11

Ensure all your wiring is correct before turning the master power supply to the system back on.

Start the ECO3 in Force Save (also known as false save) mode to check that you have installed the unit correctly. To do this, press and hold down the ENTER button as you turn the master power supply back on. The display will read 'FS'.

The compressor should stop for the duration of the Force Save. If it does not, refer to the *ECO3 Installation Manual* for troubleshooting steps.

Step 12

Provided the Force Save test is successful, you can allow it to exit the Save cycle on its own. The display will change to 'ON'.

The installation is now complete. Make sure you leave the ECO3 User Manual and Installation Sticker with the ECO3 unit for easy reference. Also leave your contact details on site.

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Installation – Quick Start

Installation Checklist

- [ ] 24 VAC power supplied to the ECO3
- [ ] Fuses fitted and in place
- [ ] Force Save test is successful
- [ ] Compressor runs correctly with ECO3 wired in
- [ ] Customer is briefed on ECO3 indicator lights and knows how to perform a Manual Bypass
- [ ] Customer is given the ECO3 User Manual and contact details for technical support
- [ ] Customer is happy with the installation

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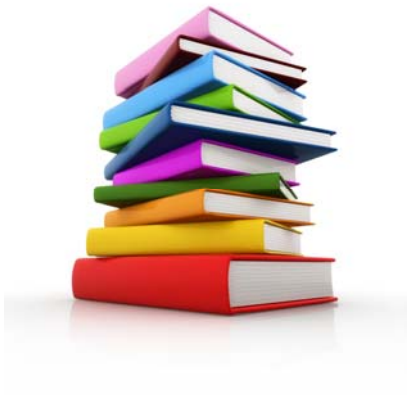
PDF Handouts



- Quick installation guide
- Full installation, operation and trouble shooting manual
- On site user manual

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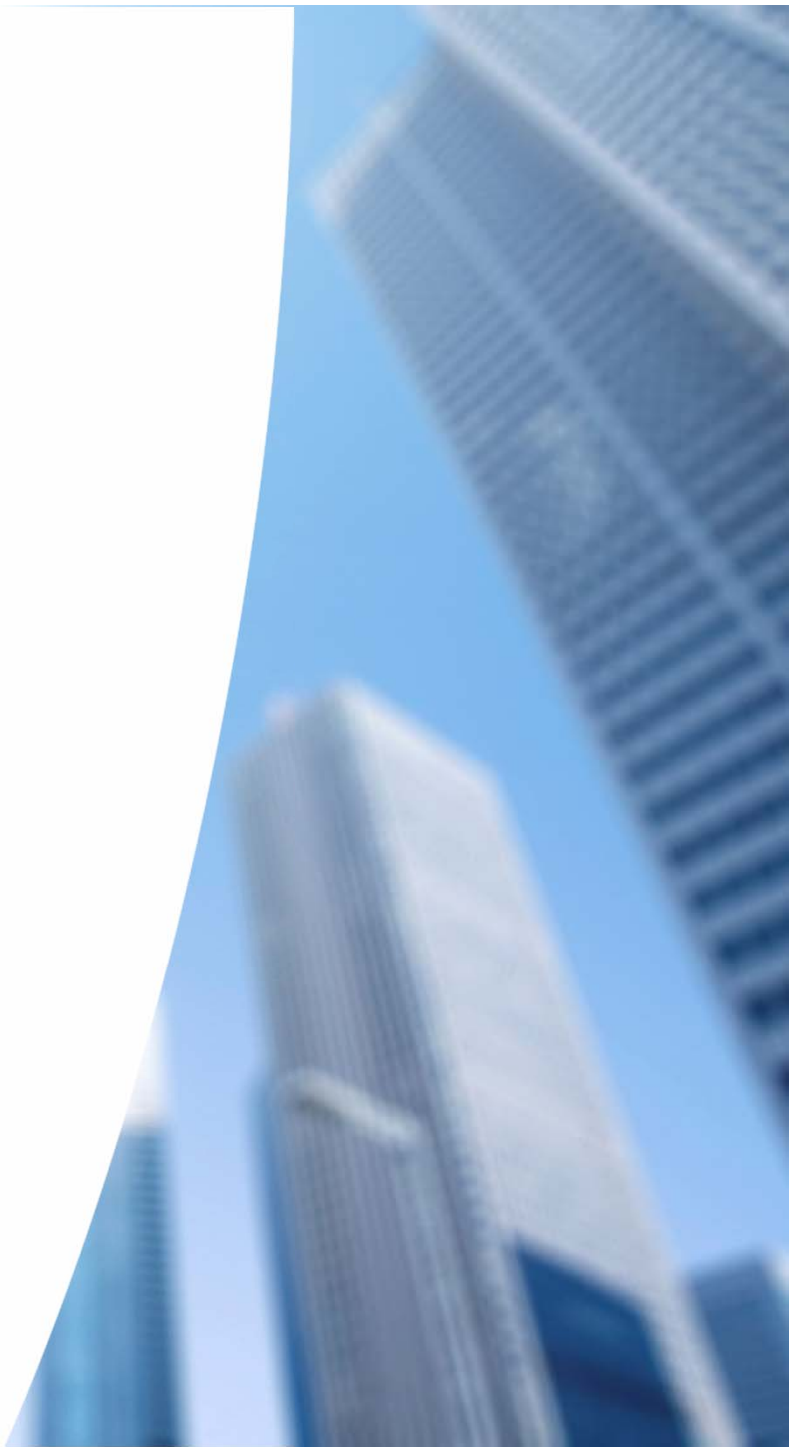
Post Installation

Performance verification



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The Smartcool Display

- Validation of energy saving measures can be hard
- Smartcool products have a simple display to show status and performance

  Status indicators
  Hours Run / Hours Saved / Hours Bypassed

$$\%\ Saved = \frac{Saved\ hours}{Run\ hours + Save\ hours + Automatic\ override\ hours}$$

$$kWh\ Saved = Saved\ hours \times kW\ motor\ size$$

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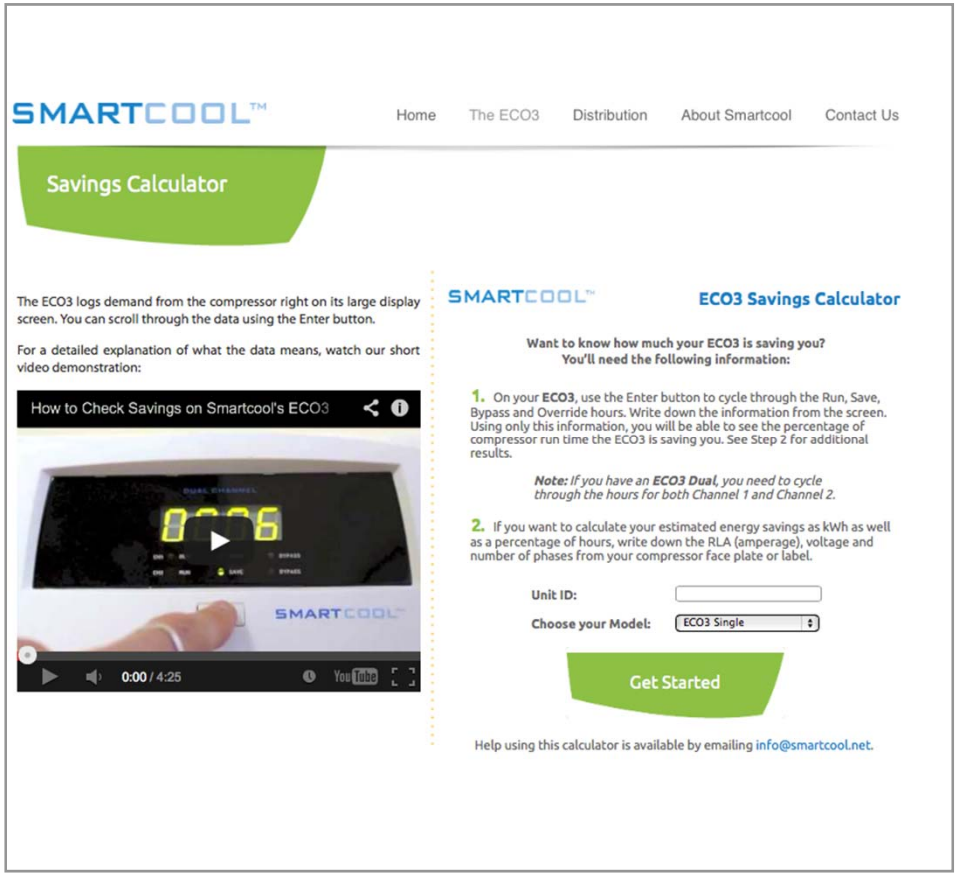
Saving Calculator

Visit the ECO3 web site for an online savings calculator

http://www.smartcooleco3.com


SMARTCOOL™
Home
The ECO3
Distribution
About Smartcool
Contact Us
Savings Calculator
The ECO3 logs demand from the compressor right on its large display screen. You can scroll through the data using the Enter button.
For a detailed explanation of what the data means, watch our short video demonstration:
How to Check Savings on Smartcool's ECO3
0:00 / 4:25
SMARTCOOL™
ECO3 Savings Calculator
Want to know how much your ECO3 is saving you?
You'll need the following information:
1. On your ECO3, use the Enter button to cycle through the Run, Save, Bypass and Override hours. Write down the information from the screen. Using only this information, you will be able to see the percentage of compressor run time the ECO3 is saving you. See Step 2 for additional results.
Note: If you have an ECO3 Dual, you need to cycle through the hours for both Channel 1 and Channel 2.
2. If you want to calculate your estimated energy savings as kWh as well as a percentage of hours, write down the RLA (amperage), voltage and number of phases from your compressor face plate or label.
Unit ID:
Choose your Model:
ECO3 Single
Get Started
Help using this calculator is available by emailing info@smartcool.net.

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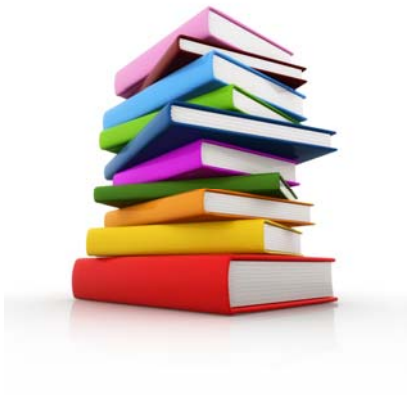
PDF Handouts



- ECO3™ Proof of savings

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Thank You

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